REMARKS/ARGUMENTS

Claims 1-27 were pending in this application. According to the December 7, 2004 Office Action, claims 8-13, 17-19, and 22-27 were withdrawn from consideration and claims 1-7, 14-16, and 20-21 were rejected. Applicants have amended claims 1, 3, 7, and 14-16 and have canceled claims 2, 4, 6, and 20-21. Accordingly, claims 1, 3, 5, 7, and 14-16 are under consideration. Applicants maintain that the amendments do not introduce any new matter.

Applicants have amended the specification at paragraph 36 to correct a typographical error.

Restriction of Invention under 35 U.S.C. §121

The Examiner indicated that claims 1-7, 14-16, and 20-21, claims 8-11, 17-19, and 22-27, and claims 12-13 are each patentably distinct species of the claimed invention and that the application be restricted to one of these inventions as required under 35 U.S.C. 121. Consistent with the telephone conversation on November 29, 2004, applicants elect claims 1-7, 14-16, and 20-21 and withdraw claims 8-13 and 17-19, and 22-27 from consideration. As noted below, applicants have canceled claims 2, 4, 6, and 20-21 in view of the Examiner's rejections in the present Office Action.

Objection to Claim 3

The Examiner objected to claim 3 for reciting "the sense resistant" rather than "the sense resistor." Applicants have amended claim 3 in accordance with the Examiner's recommendation.

Rejection of Claims 1-7, 14-16, 20 and 21 under 35 U.S.C. §112

The Examiner rejected previously presented claims 1-7, 14-16, 20 and 21 under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter of the invention. As noted above, applicants have canceled claims 2, 4, 6, and 20-21.

In particular, the Examiner rejected claim 1, and similarly claim 14, regarding the recited interconnection of the sense resistor and shunt resistor and the dividing of current there between. Specifically, the Examiner indicated that as seen in Figures 1 and 2 of the present invention, the shunt resistor 12 and sense resistor 14 belong to two separate and isolated paths and as such, the sense resistor cannot divide current supplied to the shunt resistor as recited by the claims. Applicants note that the square blocks in the Figures, such as seen at each end of "voltage buffer" 16 in Figure 1, represent points of interconnection. As such, as seen in Figures 1 and 2 and as described in the specification at paragraph 21, for example, the sense resistor and shunt resistor of the present invention are connected in parallel. Hence, while each resistor is on a separate path, these two paths are connected such that the current entering their common points of joinder (i.e., the square blocks) is divided between the two paths. In other words, the two resistors are connected in parallel and thereby form a divider circuit, as claims 1 and 14 recite.

The Examiner rejected claim 6 because it is not clear what a "reference current value" is and how it can be "subtracted from a sensed current through a sense resistor to offset the bias voltage." As described in the specification at paragraphs 35-42 and as seen in Figures 1 and 2, applicants' invention can include a voltage buffer 16 that includes a biasing voltage 20. This biasing voltage 20 produces a "reference current value" (or "base value") through sense resistor 14 that serves the purpose of maintaining the sense current through the sense resistor in a positive direction. According to the invention, this reference current value is isolated/determined and then stored. During subsequent operation of the current sense circuit, a measurement is made of the current passing through the sense resistor in order to obtain a measurement of a divided current from a current path. However, this measurement contains both the divided current and the reference current value from the biasing voltage 20. As such, to obtain a measurement of just the divided current, the reference current value is subtracted from the overall measurement made by the sense resistor. The measured divided current is then used to determine current flowing through the shunt resistor. As indicated in the specification, an integrated circuit can be used to realize the above operation. As discussed below, applicants have amended claim 1 to include the limitations of claim 6, thereby canceling claim 6. However, in amending claim 1 to include the limitations of claim 6, applicants have amended the limitations of claim 6 to more clearly recite applicants' invention.

The Examiner rejected claim 7 because it is not clear what a "reference current storage element is" and how a current can be stored. As indicated above, a reference current value can be determined and then subsequently stored for later use. Again, such a mechanism can be realized through an integrated circuit. To further clarify applicants' invention, applicants have amended claim 7 to now recite that the "reference current value is stored."

Rejection of Claims 1-7, 14-16, 20, and 21 in view of Thelen

The Examiner rejected previously presented claims 1-7, 14-16, 20, and 21 as unpatentable, 35 U.S.C. 102(b), in view of Thelen, patent 5,231,315, July 27, 1993 (hereinafter Thelen). In response to the Examiner's rejection, applicants have amended independent claim 1 to include the limitations of claims 2, 4, and 6 and further amended claim 1 to clarify applicants' invention. Accordingly, applicants have canceled claims 2, 4, and 6 and amended claims 3 and 7 to now depend from claim 1. Applicants have also amended independent claim 14 to include limitations of claim 16 and to further clarify applicants' invention. Claims 15 and 16, which depend from claim 14, have been amended according to the changes made to claim 14. To expedite the prosecution of this application, applicants have canceled claims 20 and 21.

Beginning with amended claim 1, the Examiner indicated that Thelen Figure 2 discloses a current sense circuit and in particular, equated impedance network 20 and impedance network 11 of the circuit in Figure 2 to the shunt resistor and sense resistor, respectively, of claim 1. The Examiner also indicated that there is a gain relationship between impedance networks 20 and 11 and that by knowing the current across impedance network 11, the current across impedance network 20 can be computed. Significantly, while such computations may be known, this is not applicants' invention as now more clearly recited by amended claim 1. Specifically, claim 1 now recites in part:

> a voltage buffer disposed between the shunt resistor and the sense resistor; and a biasing voltage in the voltage buffer; wherein a resistance value for the sense resistor is selected based on a range of current in the current path ...; wherein the biasing voltage produces a reference current value through the sense resistor such that a sensed current through the sense resistor comprises both the divided current from the current path and the reference current value; wherein a measurement of the divided current through the sense resistor is obtained by subtracting the reference current value

from the sensed current; and wherein a current flowing through the shunt resistor is determined based on the obtained divided current through the sense resistor and [a] gain relationship [between the shunt resistor value and the sense resistor value].

Notably, Thelen Figure 2 is not directed at a current sense circuit. Rather, in Figure 2 Thelen teaches a voltage (V_{REF}) to current (I_{OUT}) converter wherein the current remains constant independent of temperature variations. Here, Thelen uses a transistor 12 to compensate for the temperature variations of impedance network 11 and in particular, teaches that by adjusting the value for impedance network 20, the temperature coefficient of the circuit of Figure 2 can then be set to zero. Once removing the temperature dependency of the circuit, Thelen teaches that a value for impedance network 11 is selected to tune the magnitude of current I_{OUT} to a desired value. As such, Thelen is directed at obtaining a desired current Iout through impedance network 11 where Iout is temperature independent. However, nowhere does Thelen teach or suggest that once obtaining the desired current Iout through impedance network 11 there is subtracted from Iout a reference current value to obtain a measurement of a divided current from path 21 and that the current flowing through impedance network 20 is then obtained based on the obtained divided current and a gain relationship, as claim 1 now recites.

Notably, the Examiner indicated that Thelen also teaches a biasing voltage, V_{REF}, between impedance networks 11 and 20. Applicants respectfully disagree that V_{REF} is a biasing voltage because V_{REF} is the input voltage to the circuit of Figure 2 and is not between the impedance networks 11 and 20, as claim 1 recites. In addition, V_{REF}' is also not a biasing voltage but rather, is simply V_{REF} modified by resistance network 20. Nonetheless, applicants note that transistor 12 is arguably a biasing voltage and that this biasing voltage produces a current through impedance network 11, this current being in addition to a divided current from path 21. However, again, nowhere does Thelen teach or suggest that once having Iout, the current from the biasing voltage is subtracted therefrom in order to obtain a measurement of the divided current through impedance network 11 and then using this obtained divided current to determine a current flowing through the impedance network 20. Such teachings are only provided by applicants. Accordingly, Thelen fails to teach or suggest amended claim 1, and claims 3, 5, and 7, which depend therefrom.

Turning to amended claim 14, it is similar to amended claim 1 and is thereby novel and nonobvious in view of Thelen for the same reasons as set forth above. As for claim 15, it depends from claim 14 is thereby also novel and nonobvious in view of Thelen.

Turning to amended claim 16, it now recites, together with claim 14, "applying a biasing voltage between the shunt resistor and the sense resistor" wherein "the biasing voltage causes current to flow through the sense resistor in one direction." The Examiner indicated that the voltage applied to impedance network 11 of Thelen Figure 2 is a DC voltage and as such, the direction of the current through the impedance network 11 is constant, thereby teaching claim 16. Applicants note that while the direction of the current through impedance network 11 may be constant, Thelen fails to teach or suggest a biasing voltage between the shunt resistor and the sense resistor causing the constant direction. As such, Thelen fails to teach or suggest claim 16.

Rejection of Claims 1, 2, 5, 14 and 15 in view of Kitamura

The Examiner rejected previously presented claims 1, 2, and 5 as unpatentable, 35 U.S.C. 103(a), over Kitamura, patent 6,316,983, November 13, 2001 (hereinafter Kitamura) and rejected previously presented claims 14 and 15 as unpatentable, 35 U.S.C. 102(b), in view of Kitamura. As indicated above, applicants have canceled claim 2 and have amended claims 1, 5, 14, and 15.

Beginning with amended claim 1, the Examiner indicated that Kitamura Figures 14 and 15 disclose a current sense circuit and that resistances RL and Rds are the same as the shunt resistor and sense resistor, respectively, of claim 1. Notably, claim 1 now recites that the "resistance value for the sense resistor is selected based on a range of current in the current path." Applicants note that Kitamura teaches that resistance Rds is a variable resistance. However, nowhere does Kitamura teach or suggest that resistance Rds is selected based on a range of current in the current path. Specifically, resistance Rds represents the differential resistance of MOSFET 212 in Figure 14. As Kitamura teaches, this resistance simply varies as the input signal from source 202 varies. As such, the value of Rds is not an "adjustable" resistance, as indicated by the Examiner, nor is it selected based on the range of the signal from source 202, as claim 1 recites. Similarly, alternatively equating Rds and RL to the shunt resistor and the sense resistor of claim 1, respectively, is still not applicants' invention. In particular, according to Kitamura, RL is simply a

static load resistance and as such, is not being selected or adjusted. As such, Kitamura fails to teach or suggest a resistance value for the sense resistor being selected based on a range current in the current path, as claim 1 recites.

In addition, as indicated above, claim 1also recites that the current sense circuit comprises a biasing voltage and that this biasing voltage "produces a reference current value through the sense resistor such that a sensed current through the sense resistor comprises both the divided current from the current path and the reference current value." While Kitamura teaches in Figure 15, for example, that a divided current from source 202 flows through Rds, Kitamura fails to teach or suggest that the circuits of Figures 14 and 15 also include a biasing voltage and that in addition to a divided current through Rds there is also a reference current through Rds.

Furthermore, while Kitamura may teach a gain ratio/relationship between resistor RL and resistor Rds that can be used to compute the current through RL by knowing the current through Rds, nowhere does Kitamura teach or suggest that "a measurement of the divided current through [Rds] is obtained by subtracting [a] reference current value from [a] sensed current" and that the "current flowing through [RL] is [then] determined based on the obtained divided current through [Rds] and [a] gain relationship." Kitamura Figures 14 and 15 are directed at a predistortion circuit and as such, Kitamura is completely divergent from a current sense circuit and completely divergent from applicants invention as now recited by amended claim 1. Accordingly, Kitamura fails to teach or suggest amended claim 1, together with claim 5, which depends therefrom.

Turning to amended claim 14, it is similar to amended claim 1 and is thereby novel and nonobvious in view of Kitamura for the same reasons as set forth above. As for claim 15, it depends from claim 14 is thereby also novel and nonobvious in view of Kitamura.

Since Thelen and Kitamura fail to teach or suggest applicants' invention as now set forth in amended claims 1, 3, 5, 7, and 14-16, applicants submit that these claims are clearly allowable. Favorable reconsideration and allowance of these claims are therefore requested.

Applicants earnestly believe that this application is now in condition to be passed to issue, and such action is also respectfully requested. However, if the Examiner deems it would in any way

facilitate the prosecution of this application, he is invited to telephone applicants' counsel at the number given below.

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as First Class Mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on March 10, 2005:

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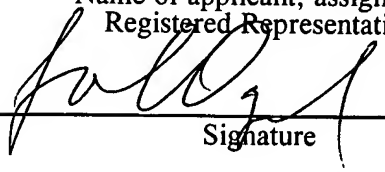

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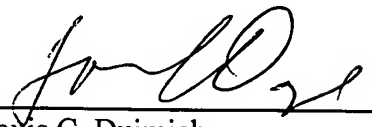
Respectfully submitted,



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